COMPETITION IN AIR TRANSPORT: THE CASE OF THE HIGH SPEED TRAIN

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ABSTRACT

Over the past decades, passenger transport has undergone important changes concerning the modal distribution of demand. The dominant position of the railways began to lose its leading foothold in favour of the plane, for long distances, and of the private vehicle, for shorter distances. This has been as a result of the loss of competitiveness of the traditional train in relation to other transportation services, originating from travel times far superior to those of alternative modes.

In this context, the high-speed train was introduced as a new form of understanding railway transport, notably improving the quality of service offered. This investment will affect the generalised costs related to the alternatives and may generate a redistribution of journeys between them, varying the existing modal distribution. The aim of this article is to evaluate the potential of the future high-speed train to compete with current demand for the airline service in Spain. The physical and supply characteristics of existing transport portray the Madrid-Barcelona route as an optimal setting for this aim. Firstly, it will connect the two capital cities with the greatest number of inhabitants in the country, with 4.7 million inhabitants in the case of Barcelona and 5.1 million in Madrid. On the other hand, the 620 kilometres between them suppose an extremely interesting line for a high-speed investment, reducing the length of the train journey from the current approximately six hours to two and a half or three hours, thus converting it into the fastest land transport on this route. The impact of this investment on the demand for airline travel is quite uncertain and of great interest, given that the run analysed offers the frequency of the most competitive flights in the country, reaching timetables with departures every 15 minutes.

The potential capacity of the future high-speed train to compete on this market is analysed in this article. Demand modelling is developed in a hypothetical context, allowing for this

alternative to be characterised, in spite of it not being available in reality. Experimental design techniques are applied which, based on the information collected, will allow for the estimation of a probabilistic choice model, so as to collect and characterise the preferences of passengers concerning alternatives for travel. With this information, it will be possible to predict the behaviour of passengers in the near future and to simulate different policy options for transport supply. The monetary value of the different types of time-associated travel is also derived. The expansive policy predicted within Europe in high-speed infrastructures supposes the commitment of a huge amount of resources. Therefore, it is important to have the necessary information available so that this allocation may be efficiently achieved. In this sense, the results of this article may be extended to other contexts.

2 MODELLING APPROACH AND DATA SOURCES

2.1 Demand Model

To analyse the modal choices of passengers, a demand model must be developed that allows for their preferences to be characterised in comparison with travel alternatives. Discrete choice models are the most suitable for this aim, as they guarantee consistency between demand function and consumer theory (McFadden, 1974).

2.2 Experimental design

Discrete choice depends on individual preferences concerning travel alternatives. In the case of the plane, the individuals know the alternative, given that it is the one chosen for travel by the population under analysis. However, the *hst* is not yet available in the set of real choices, resulting in their preferences concerning this option and its characteristics are not defined or, at least, cannot be observed. To develop the demand model, in a context with *hst*, it is necessary to build a hypothetical market, including this alternative as a travel option. In this market, the individuals analyse different scenarios with changing characteristics for the alternatives described and choose the alternative preferred for travel in each context. To characterise supply implies defining the variables set out above. For this, *experimental design techniques* are applied; in particular, we select a main effect fractional factorial model (Louviere, 1988; Bates, 1988; Hensher, 1988) that allows for trade-off situations to be presented to the passengers between travel attributes and alternatives.

2.3 Data collection

The target population are the current plane travelers using the Madrid-Barcelona line. The information was collected from a survey using choice-based sampling procedures (Ben-Akiva and Lerman, 1985).

As well as the experiment described, the survey also collected a group of questions concerning the journey and the socio-economic characteristics of the individual. These questions may be relevant for demand modelling to estimate heterogeneous effects due to different types of travelers and journeys.

The survey provided a total of 4347 observations, of which 3618 originated from business trips and 726 for leisure.

3 MODELLING RESULTS

With this information, *logit* discrete choice models are estimated. The demand model allows for individual preferences to be characterised in relation to the travel alternatives and their characteristics. Based on these results, it will be possible to obtain aggregate demand measures that allow for prediction and simulation of scenarios under different hypotheses on transport policy options. Aggregate measures of willingness to pay to save time are also consistently derived as the monetary value of the different times associated to the journey.

4 CONCLUSIONS

In this article, the potential of the high-speed train to compete with the plane has been analysed. A hypothetical context of experimental design is established, given that the high-speed alternative does not exist on the route under analysis, and it is evaluated under which supply or service conditions would current air passengers be able to alter their choice. Based upon the demand modelling carried out, aggregate demand measures are obtained to evaluate the impact of the new travel option in terms of the potential deviation of passengers. Monetary values of time are also derived that collect the individual's willingness to pay in order to save time at any point of the journey.

The results firstly confirm that the individuals derive disutility from assigning monetary and time resources to the journey and there is also evidence concerning the existing

heterogeneity between those travelling during working hours and those in leisure time. Both results coincide with the empirical evidence that can be derived from the literature.

Investment decisions and high-speed service planning will be determinant in defining future demand scenarios. In particular, price levels and travel times with which this new alternative competes on the market will affect the size of the deviation from air travel. In general terms, it is concluded that the future high-speed alternative will have a considerable impact on the demand for air travel, an important flow of passengers that currently use the plane to the new railway service being expected. However, as the distance and, therefore, the travel time increases, the advantages of the high-speed train decrease dramatically, losing competitiveness in favour of the plane, especially in the business segment. This has occurred in other experiences known, such as the *Tgv* on the Toulouse-Paris line. Based on existing evidence and upon our own results, it is possible to conclude that the high-speed train may be considered as a truly competitive product over distances that may be covered in 3 hours, at most. It is in this context where the high-speed train may be able to compete with the plane, given that for longer journeys, the plane continues to be the preferred service. This argument is relevant if we consider that part of the high-speed train's competitiveness with the plane depends upon this variable, so that the aggregate time that travelling from the point of origin supposes may be considered the same as the times associated with both alternatives.

Monetary valuations of time have also been obtained. In this sense, this research supposes an important contribution. The existing evidence is mainly aimed primarily at the demand analysis of travel in an urban context and, more precisely, in the trips to or from work, a very particular segment of travel demand, where the determining factors may differ considerably in relation to other types of travel. Research in interurban contexts is scarcer and especially lacking in analyses where the plane or the high-speed train are presented as travel alternatives.

The demand modelling carried out allows for the confirmation that individuals assign a different valuation to each of the times associated to the journey. The values of time obtained also present important differences according to the purpose of the journey. The results concerning the social profitability of an investment in transport depend to a large extent on the monetary measures available for valuing the social benefits derived from

savings in time. It is important for these valuations to be consistently derived so that the result obtained may be considered credible. The results set out in this article are given in terms of reducing the level of arbitrariness in the social appraisal of investments and thus rationalising the assignment of public resources.

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